SUMMARY OF AIR QUALITY IMPACT ANALYSIS FOR THE RUSSELL CITY ENERGY CENTER

September 24, 2001

BACKGROUND

Calpine Corporation and Bechtel Enterprises Holdings, Inc. has submitted a permit application (# 2896) for a proposed 600 MW combined cycle power plant, the Russell City Energy Center (RCEC). The facility is to consist of two natural gas-fired turbines with supplementary fired heat recovery steam generators, one steam turbine and supplemental burners (duct burners), a 10-cell cooling tower, a natural gas fueled emergency generator and a diesel fire pump engine. The proposed project will result in an increase in air pollutant emissions of NO_2, CO, PM_{10} and SO_2 triggering regulatory requirements for an air quality impact analysis.

AIR QUALITY IMPACT ANALYSIS REQUIREMENTS

Requirements for air quality impact analysis are given in the District's New Source Review (NSR) Rule: Regulation 2, Rule 2.

The criteria pollutant annual worst case emission increases for the Project are listed in Table I, along with the corresponding significant emission rates for air quality impact analysis.

TABLE E-1
Comparison of proposed project's annual worst case emissions
to significant emission rates for air quality impact analysis

Pollutant	Proposed Project's Emissions (tons/year)	Significant Emission Rate (tons/year) (Reg-2-2-304 to 2-2-306)	EPA PSD Significant Emission Rates for major stationary sources (tons/year)
NO_2	134.6	100	40
CO	610.2	100	100
PM_{10}	86.3	100	15
SO_2	12.4	100	40

Table I indicates that the proposed project emissions exceed District significant emission levels for nitrogen oxides (NO_x), carbon monoxide (CO), and respirable particulate matter (PM_{10}). The source is classified as a major stationary source as defined under the Federal Clean Air Act. Therefore, the air quality impact must be investigated for all pollutants emitted in quantities larger than the EPA PSD significant emission rates (shown in the last column in Table I). Table I shows that the NO_2, CO and PM_{10} ambient impacts from the project must be modeled. The detailed requirements for an air quality

impact analysis for these pollutants are given in Sections 304, 305 and 306 of the District's NSR Rule and 40 CFR 51.166 of the Code of Federal Regulations.

The District's NSR Rule also contains requirements for certain additional impact analyses associated with air pollutant emissions. An applicant for a permit that requires an air quality impact analysis must also, according to Section 417 of the NSR Rule, provide an analysis of the impact of the source and source-related growth on visibility, soils and vegetation.

AIR QUALITY IMPACT ANALYSIS SUMMARY

The required contents of an air quality impact analysis are specified in Section 414 of Regulation 2 Rule 2. According to subsection 414.1, if the maximum air quality impacts of a new or modified stationary source do not exceed significance levels for air quality impacts, as defined in Section 2-2-233, no further analysis is required. (Consistent with EPA regulations, it is assumed that emission increases will not interfere with the attainment or maintenance of AAQS, or cause an exceedance of a PSD increment if the resulting maximum air quality impacts are less than specified significance levels). If the maximum impact for a particular pollutant is predicted to exceed the significance impact level, a full impact analysis is required involving estimation of background pollutant concentrations and, if applicable, a PSD increment consumption analysis. EPA also requires a Class I increment analysis of any PSD source which increases NO_2 or PM_{10} concentrations by 1 ìg/m^3 or more (24-hour average) in a Class I area.

Air Quality Modeling Methodology

Maximum ambient concentrations of NO_2, CO and PM_{10} were estimated for various plume dispersion scenarios using established modeling procedures. The plume dispersion scenarios addressed include simple terrain impacts (for receptors located below stack height), complex terrain impacts (for receptors located at or above stack height), impacts due to building downwash, impacts due to inversion breakup fumigation, and impacts due to shoreline fumigation.

Emissions from the turbines and burners will be exhausted from two 145 foot exhaust stacks, the emergency generator will be exhausted from a 10 foot stack, and the fire pump will be exhausted from a 30 foot exhaust stack. Emissions from a 10-cell cooling tower will be released at a height of 64 feet. Table II contains the emission rates used in each of the modeling scenarios: turbine commissioning, turbine startup, maximum 1-hour, maximum 8-hour, maximum 24-hour, and maximum annual average. Commissioning is the original startup of the turbines and only occurs during the initial operation of the equipment after installation. Startup conditions were modeled with one turbine in startup mode, while the other turbine was in normal operation.

The EPA models SCREEN3 and ISCST3 were used in the air quality impacts analysis. A land use analysis showed that the rural dispersion coefficients were required for the analysis. The models were run using five years of meteorological data (1990 through 1994) collected approximately 6.6 km southeast of the project at the BAAQMD's Union City meteorological monitoring station. Because the exhaust stacks are less than Good Engineering Practice (GEP) stack height, ambient impacts due to building downwash were evaluated. Using 1990-1994 San Leandro ozone monitoring data, the Ozone

Limiting Method was employed to convert one-hour NO_x impacts into one-hour NO_2 impacts. (The San Leandro monitoring station is located 8.8 km north of the project) The Ambient Ratio Methodology (with a default NO_2/NO_x ratio of 0.75) was used for determining the annual-averaged NO_2 concentrations. Because complex terrain was located nearby, complex terrain impacts were considered. Inversion breakup fumigation and shoreline fumigation were evaluated using the SCREEN3 model.

TABLE E-2
Averaging period emission rates used in modeling analysis (g/s)

Pollutant Source	Max. (1-hour)	Commissioning[1] (1-hour)	Start-up[2] (1-hour)	Max. (8-hour)	Max. (24-hour)	Max. Annual Average
NO_2						
Turbine/Duct Burner 1	1.591	48.132	1.591	—	—	1.927
Turbine/Duct Burner 2	1.591	—	10.08			1.927
Emergency Generator	—	—	—			0.0051
Fire Pump	0.491	—	—			0.00168
Each Cooling Tower Cell (10 total)	—	—	—			
CO						
Turbine/Duct Burner 1	2.356	11.9	2.356	41.07[3]	—	—
Turbine/Duct Burner 2	2.356	—	113.65	41.07[3]		
Emergency Generator	0.380	—	—	0.0370		
Fire Pump	—	—	—	—		
Each Cooling Tower Cell (10 total)	—	—	—	—		
PM_{10}						
Turbine/Duct Burner 1	—	—	—	—	1.134	1.20
Turbine/Duct Burner 2					1.134	1.20
Emergency Generator					—	0.0000018
Fire Pump					0.000669	0.000055
Each Cooling Tower Cell (10 total))					0.00863	0.00863

[1]Commissioning is the original startup of a turbine and only occurs during the initial operation of the equipment after installation. Both turbines will not be commissioned at the same time. [2]Start-up is the beginning of any of the subsequent duty cycles to bring one turbine from idle status up to power production. [3]Maximum 8 hour CO emissions include start-up period emissions.

Air Quality Modeling Results

The maximum predicted ambient impacts of the various modeling procedures described above are summarized in Table III for the averaging periods for which AAQS and PSD increments have been set. Shown in Figure 1 are the locations of the maximum modeled impacts.

Also shown in Table III are the corresponding significant ambient impact levels listed in Section 233 of the District's NSR Rule. In accordance with Regulation 2-2-414 further analysis is required only for the

those pollutants for which the modeled impact is above the significant air quality impact level. Table III shows that the only impact requiring further analysis is the 1-hour NO_2 modeled impact.

TABLE E-3
Maximum predicted ambient impacts of proposed project ($\mu g/m^3$)
[maximums are in bold type]

Pollutant	Averaging Time	Commissioning Maximum Impact	Start-up (one hour)	Inversion Break-up Fumigation Impact	Shoreline Fumigation Impact	ISCST3 Modeled Impact	Significant Air Quality Impact Level
NO_2	1-hour	120.7	75.0	13.2	34.6	**216**	19
	annual	—	—	—	—	**0.36**	1.0
CO	1-hour	69.8	890	15.3	39.9	**1231**	2000
	8-hour	—	—	7.8	20.1	**254**	500
PM_{10}	24-hour	—	—	1.6	4.1	**4.1**	5
	annual	—	—	—	—	**0.22**	1

Background Air Quality Levels

Regulation 2-2-111 entitled "Exemption, PSD Monitoring," exempts an applicant from the requirement of monitoring background concentrations in the impact area (section 414.3) provided the impacts from the proposed project are less than specified levels. Table IV lists the applicable exemption standard and the maximum impact from the proposed facility. As shown, the modeled NO_2 impact is well below the preconstruction monitoring threshold.

TABLE E-4
PSD monitoring exemption level and maximum impact
from the proposed project for NO_2 ($\mu g/m^3$)

Pollutant	Averaging Time	Exemption Level	Maximum Impact from Proposed Project
NO_2	annual	14	0.36

The District-operated Fremont-Chapel Way Monitoring Station, located 18.3 km southeast of the project, was chosen as representative of background NO_2 concentrations. Table V contains the concentrations measured at the site for the past 5 years (1996 through 2000).

TABLE E-5
Background NO_2 ($\mu g/m^3$) at Fremont-Chapel Way Monitoring Station for the past five years (maximum is in bold type)

	NO_2
Year	Highest 1-hour average
1996	165
1997	162
1998	184
1999	**211**
2000	152

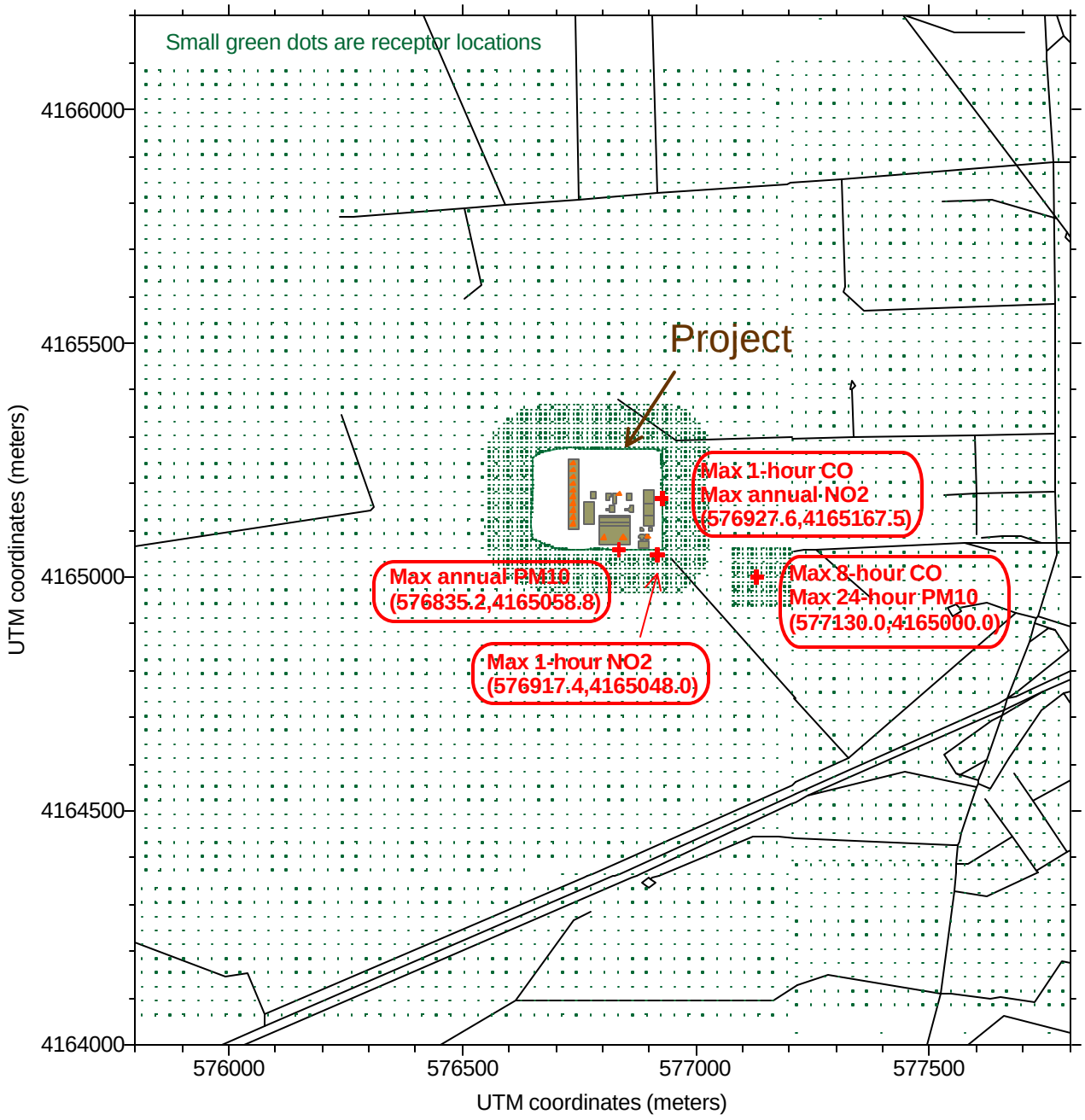

FIGURE 1. Location of project maximum impacts.

Table VI below contains the comparison of the ambient standards with the proposed project impacts added to the maximum background concentrations. The California ambient NO_2 standard is not exceeded from the proposed project.

TABLE E-6
California and national ambient air quality standard and
ambient air quality level from the proposed project ($\mu g/m^3$)

Pollutant	Averaging Time	Maximum Background	Maximum combined project and existing facility impact	Maximum combined impact plus maximum background	California Standard	National Standard
NO_2	1-hour	211	216	427	470	---

CLASS I PSD INCREMENT ANALYSIS

EPA requires an increment analysis of any PSD source within 100 km of a Class I area which increases NO_2 or PM_{10} concentrations by 1 $\mu g/m^3$ or more (24-hour average) inside the Class I area. Point Reyes National Seashore is located roughly 62 km northwest of the project, and is the only Class I area within 100 km of the facility. Shown in Table VII are the results from an impact analysis using both Calpuff and ISCST3. The table shows that the maximum 24-hour NO_2 and PM_{10} impacts within the Point Reyes National Seashore are well below the 1 $\mu g/m^3$ significance level (see Table VII)

TABLE E-7
Class I 24-hour air quality impacts analysis for the Point Reyes National Seashore ($\mu g/m^3$)

Pollutant	Calpuff	ISCST3	Significance level	Significant
NO_2	0.30	0.28	1.0	no
PM_{10}	0.12	0.16	1.0	no

VISIBILITY, SOILS AND VEGETATION IMPACT ANALYSIS

Visibility impacts were assessed using both EPA's VISCREEN visibility screening model and the Calpuff model. Both analyses show that the proposed project will not cause any impairment of visibility at Point Reyes National Seashore, the closest Class I area.

The project maximum one-hour average NO_2, including background, is 427 $\mu g/m^3$. This concentration is below the California one-hour average NO_2 standard of 470 $\mu g/m^3$. Crop damage from NO_2 requires exposure to concentrations higher than 470 $\mu g/m^3$ for periods longer than one hour.

Maximum project NO_2, CO, SO_2 and PM_{10} concentrations would be less than all of the applicable national primary and secondary ambient air quality standards, which are designed to protect the public

welfare form any known or anticipated effects, including plant damage. Therefore, the facility's impact on soils and vegetation would be insignificant.

CONCLUSIONS

The results of the air quality impact analysis indicate that the proposed project would not interfere with the attainment or maintenance of applicable AAQS for NO_2, CO and PM_{10}. The analysis was based on EPA approved models and calculation procedures and was performed in accordance with Section 414 of the District's NSR Rule.